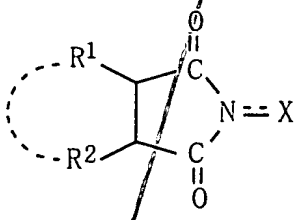
CLAIMS

1. A process for producing an organic compound, said process comprising the step of allowing (A) a compound capable of forming a stable radical and being selected from (A1) oxygen-atom-containing compounds each having a carbon-hydrogen bond at the adjacent position to an oxygen atom, (A2) carbonyl-group-containing compounds, and (A3) compounds each having a hydrocarbon group with a methine carbon atom to react with (B) a radical scavenging compound selected from (B1) unsaturated compounds, (B2) compounds each having a hydrocarbon group with a methine carbon atom, and (B3) heteroatom-containing compounds, provided that if a 1,2-dicarbonyl compound or its hydroxy reductant is used as the compound (A), the compound (B) is a radical scavenging compound selected from the compounds (B1) and (B3), in the presence of a catalytic imide compound shown by the following formula (1):

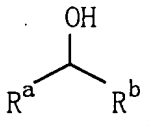


(1)

wherein each of R^1 and R^2 is, identical to or different from each other, a hydrogen atom, a halogen atom, an alkyl group, an aryl group, a cycloalkyl group, a hydroxyl group, an alkoxy group, a carboxyl group, an alkoxycarbonyl group, or an acyl

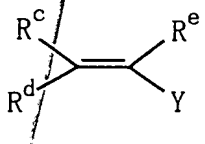
group, where R^1 and R^2 may be combined to form a double bond, or an aromatic or non-aromatic ring; X is an oxygen atom or a hydroxyl group; and one or two N-substituted cyclic imido groups indicated in the formula (1) may be further bonded to said R^1, R^2, or to the double bond or aromatic or non-aromatic ring formed together by R^1 and R^2,
and in the presence of oxygen and/or a radical generator with respect to said imide compound, to yield a product of an addition or substitution reaction of said compound (A) and said compound (B) or an oxidized product thereof.

2. A process for producing an organic compound according to claim 1, wherein (A11) an alcohol shown by the following formula (2):



(2)

wherein each of R^a and R^b is, identical to or different from each other, a hydrogen atom or an organic group, where R^a and R^b may be combined to form a ring with the adjacent carbon atom, is allowed to react with (B11) an active olefin shown by the following formula (3):

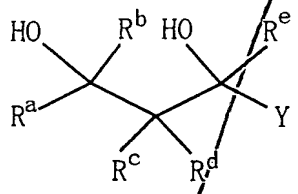


(3)

wherein each of R^c, R^d, and R^e is, identical to or different

from one another, a hydrogen atom or an organic group, and Y is an electron attracting group, where R^c, R^d, R^e, and Y may be combined to form a ring with the adjacent carbon atom or carbon-carbon bond,

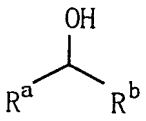
in the presence of molecular oxygen by catalysis of the imide compound of the formula (1) to yield a 1,3-dihydroxy compound shown by the following formula (4):



(4)

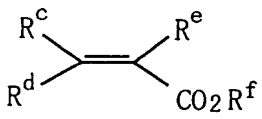
wherein R^a, R^b, R^c, R^d, R^e, and Y have the same meanings as defined above.

3. A process for producing an α-hydroxy-γ-butyrolactone derivative, said process comprising the step of allowing (A11) an alcohol shown by the following formula (2):



(2)

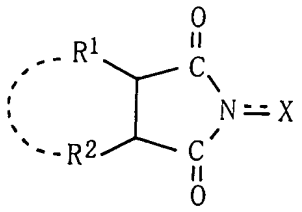
wherein each of R^a and R^b is, identical to or different from each other, a hydrogen atom or an organic group, where R^a and R^b may be combined to form a ring with the adjacent carbon atom, to react with (B12) an α,β-unsaturated carboxylic acid derivative shown by the following formula (5):



(5)

wherein each of R^c, R^d, R^e, and R^f is, identical to or different from one another, a hydrogen atom or an organic group, where R^c, R^d, and R^e may be combined to form a ring with the adjacent carbon atom or carbon-carbon bond,

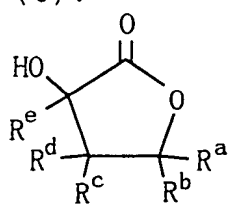
in the presence of molecular oxygen by catalysis of an imide compound shown by the following formula (1):



(1)

wherein each of R^1 and R^2 is, identical to or different from each other, a hydrogen atom, a halogen atom, an alkyl group, an aryl group, a cycloalkyl group, a hydroxyl group, an alkoxy group, a carboxyl group, an alkoxycarbonyl group, or an acyl group, where R^1 and R^2 may be combined to form a double bond, or an aromatic or non-aromatic ring; X is an oxygen atom or a hydroxyl group; and one or two N-substituted cyclic imido groups indicated in the formula (1) may be further bonded to said R^1, R^2, or to the double bond or aromatic or non-aromatic ring formed together by R^1 and R^2,

to yield an α-hydroxy-γ-butyrolactone derivative shown by the following formula (6):

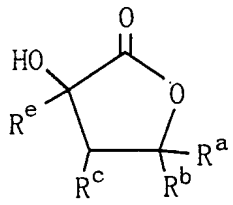


(6)

cont a2

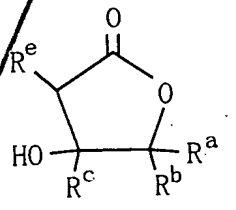
wherein R^a, R^b, R^c, R^d, and R^e have the same meanings as defined above.

4. A process for producing a β-hydroxy-γ-butyrolactone derivative, said process comprising the step of dissolving an α-hydroxy-γ-butyrolactone derivative shown by the following formula (6a):



(6a)

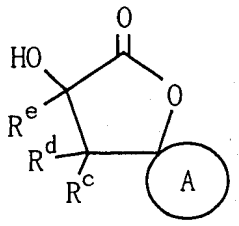
wherein each of R^a and R^b is, identical to or different from each other, a hydrogen atom or an organic group, where R^a and R^b may be combined to form a ring with the adjacent carbon atom; and each of R^c and R^e is, identical to or different from each other, a hydrogen atom or an organic group, where R^c and R^e may be combined to form a ring with the adjacent carbon-carbon bond, in a solvent to yield a β-hydroxy-γ-butyrolactone derivative shown by the following formula (7):



(7)

wherein R^a, R^b, R^c, and R^e have the same meanings as defined above.

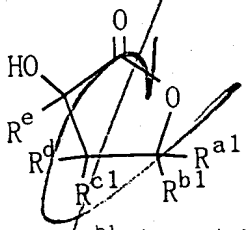
5. An α-hydroxy-γ-butyrolactone derivative shown by the following formula (6b):



(6b)

wherein ring A is a non-aromatic carbon ring, each of R^c, R^d, and R^e is, identical to or different from one another, a hydrogen atom or an organic group, where R^c, R^d, and R^e may be combined to form a ring with the adjacent carbon atom or carbon-carbon bond.

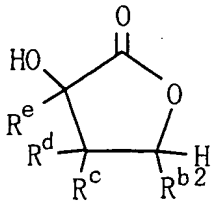
6. An α-hydroxy-γ-butyrolactone derivative shown by the following formula (6c):



(6c)

wherein each of R^{a1} and R^{b1} is, identical to or different from each other, a hydrogen atom, a hydrocarbon group, or a heterocyclic group, where R^{a1} and R^{b1} may be combined to form a ring with the adjacent carbon atom; R^{c1} is a haloalkyl group, a substituted oxycarbonyl group, a cyano group, or an aryl group; each of R^d and R^e is, identical to or different from each other, a hydrogen atom or an organic group, where R^{c1}, R^d, and R^e may be combined to form a ring with the adjacent carbon atom or carbon-carbon bond.

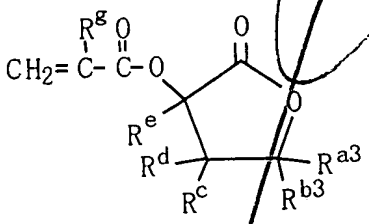
7. An α-hydroxy-γ-butyrolactone derivative shown by the following formula (6d):



(6d)

wherein R^{b2} is, identical to or different from each other, a hydrocarbon group or a heterocyclic group, and each of R^c, R^d, and R^e is, identical to or different form each other, a hydrogen atom or an organic group, where R^c, R^d, and R^e may be combined to form a ring with the adjacent carbon atom or carbon-carbon bond.

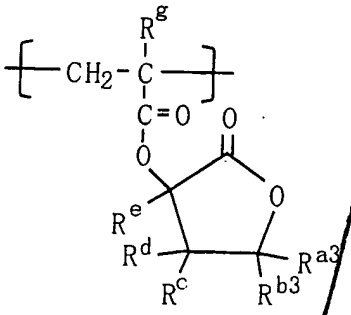
8. An α-(meth)acryloyloxy-γ-butyrolactone derivative shown by the following formula (8):



(8)

wherein each of R^{a3} and R^{b3} is, identical to or different from each other, a hydrogen atom, a hydrocarbon group, or a heterocyclic group, where R^{a3} and R^{b3} may be combined to form a ring with the adjacent carbon atom; each of R^c, R^d, and R^e is, identical to or different from one another, a hydrogen atom or an organic group, where R^c, R^d, and R^e may be combined to form a ring with the adjacent carbon atom or carbon-carbon bond; and R^g is a hydrogen atom or a methyl group.

9. A polymer comprising a structural unit shown by the following formula (9):

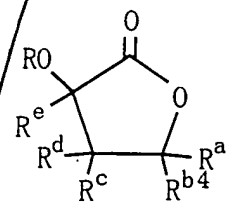


(9)

wherein each of R^{a3} and R^{b3} is, identical to or different from each other, a hydrogen atom, a hydrocarbon group, or a heterocyclic group, where R^{a3} and R^{b3} may be combined to form a ring with the adjacent carbon atom; each of R^c, R^d, and R^e is, identical to or different from one another, a hydrogen atom or an organic group, where R^c, R^d, and R^e may be combined to form a ring with the adjacent carbon atom or carbon-carbon bond; and R^g is a hydrogen atom or a methyl group.

10. A photosensitive resinous composition comprising the polymer as claimed in claim 9 and a light-activatable acid generator.

11. A γ-butyrolactone derivative shown by the following formula (10):



(10)

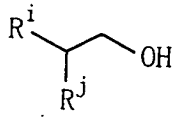
wherein R is a hydrogen atom or a (meth)acryloyl group; each of R^a, R^c, R^d, and R^e is, identical to or different from one another, a hydrogen atom or an organic group; and R^{b4} is a bridged

cyclic hydrocarbon group, where R^c, R^d, and R^e may be combined to form a ring with the adjacent carbon atom or carbon-carbon bond.

12. A γ-butyrolactone derivative according to claim 11, wherein said bridged cyclic hydrocarbon group is a bicyclic or tricyclic bridged hydrocarbon group.

13. A γ-butyrolactone derivative according to claim 11, wherein a bridged ring in said bridged cyclic hydrocarbon group is an adamantane ring, a perhydroindene ring, a decalin ring, a perhydrofluorene ring, a perhydroanthracene ring, a perhydrophenanthrene ring, a tricyclo[5.2.1.$0^{2,6}$]decane ring, a perhydroacenaphthene ring, a perhydrophenalene ring, a norbornane ring, or a norbornene ring.

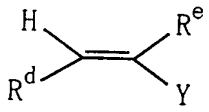
14. A process for producing a conjugated unsaturated compound, said process comprising the step of allowing (A12) an alcohol shown by the following formula (2a):



(2a)

wherein each of R^i and R^j is, identical to or different from each other, a hydrogen atom or an organic group, where R^i and R^j may be combined to form a ring with the adjacent carbon atom, to react with (B13) an active olefin shown by the following formula (3a):

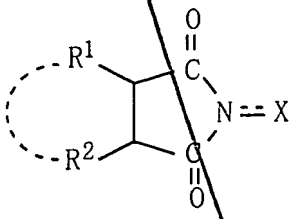
Cont 32



(3a)

wherein each of R^d and R^e is, identical to or different from each other, a hydrogen atom or an organic group; and Y is an electron attracting group, where R^d, R^e and Y may be combined to form a ring with the adjacent carbon atom or carbon-carbon bond,

in the presence of molecular oxygen by catalysis of an imide compound shown by the following formula (1):

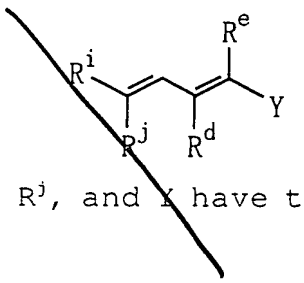


(1)

wherein each of R^1 and R^2 is, identical to or different from each other, a hydrogen atom, a halogen atom, an alkyl group, an aryl group, a cycloalkyl group, a hydroxyl group, an alkoxy group, a carboxyl group, an alkoxycarbonyl group, or an acyl group, where R^1 and R^2 may be combined to form a double bond, or an aromatic or non-aromatic ring; X is an oxygen atom or a hydroxyl group; and one or two N-substituted cyclic imido groups indicated in the formula (1) may be further bonded to said R^1, R^2, or to the double bond or aromatic or non-aromatic ring formed together by R^1 and R^2,

to yield a conjugated unsaturated compound shown by the following formula (11):

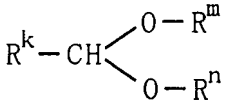
Cont B2



(11)

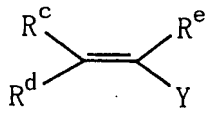
wherein R^d, R^e, R^i, R^j, and Y have the same meanings as defined above.

15. A process for producing an organic compound according to claim 1, wherein (A13) an acetal shown by the following formula (12):



(12)

wherein each of R^k, R^m, and R^n is, identical to or different from one another, a hydrogen atom or an organic group, where R^m and R^n may be combined to form a ring with the adjacent two oxygen atoms and the carbon atom indicated in the formula, is allowed to react with (B11) an active olefin shown by the following formula (3):

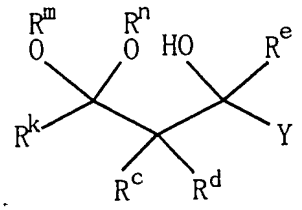


(3)

wherein each of R^c, R^d, and R^e is, identical to or different from one another, a hydrogen atom or an organic group, and Y is an electron attracting group, where R^c, R^d, R^e, and Y may be combined to form a ring with the adjacent carbon atom or carbon-carbon bond,

in the presence of molecular oxygen by catalysis of the imide

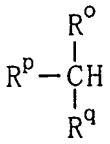
compound of the formula (1), to yield a β-hydroxyacetal compound shown by the following formula (13):



(13)

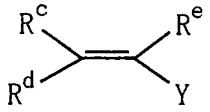
wherein R^c, R^d, R^e, R^k, R^m, R^n, and Y have the same meanings as defined above.

16. A process for producing an organic compound according to claim 1, wherein (A31) a compound having a methine carbon atom and being shown by the following formula (14):



(14)

wherein each of R^o, R^p, and R^q is, identical to or different from one another, an organic group, where R^o, R^p, and R^q may be combined to form a ring with the adjacent carbon atom, is allowed to react with (B11) an active olefin shown by the following formula (3):

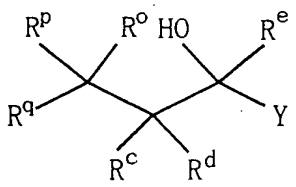


(3)

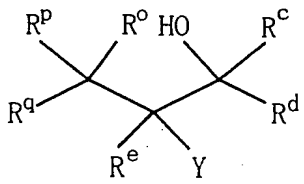
wherein each of R^c, R^d, and R^e is, identical to or different from one another, a hydrogen atom or an organic group; and Y is an electron attracting group, where R^c, R^d, and Y may be

combined to form a ring with the adjacent carbon atom or carbon-carbon bond,

in the presence of molecular oxygen by catalysis of the imide compound of the formula (1), to yield at least one hydroxy compound selected from the following formulae (15) and (16):



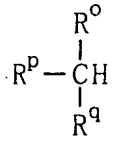
(15)



(16)

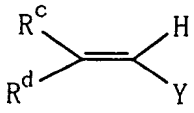
wherein R^c, R^d, R^e, R^o, R^p, R^q, and Y have the same meanings as defined above.

17. A process for producing an organic compound according to claim 1, wherein (A31) a compound having a methine carbon atom and being shown by the following formula (14):



(14)

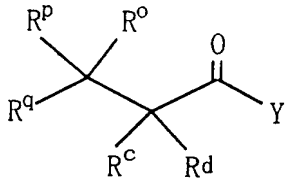
wherein each of R^o, R^p, and R^q is, identical to or different from one another, an organic group, where R^o, R^p, and R^q may be combined to form a ring with the adjacent carbon atom, is allowed to react with (B14) an active olefin shown by the following formula (3b):



(3b)

wherein each of R^c and R^d is, identical to or different from each other, a hydrogen atom or an organic group; and Y is an electron attracting group, where R^c, R^d, and Y may be combined to form a ring with the adjacent carbon atom or carbon-carbon bond,

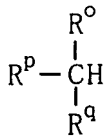
in the presence of molecular oxygen by catalysis of the imide compound of the formula (1), to yield a carbonyl compound shown by the following formula (17):



(17)

wherein R^c, R^d, R^o, R^p, R^q, and Y have the same meanings as defined above.

18. A process for producing a compound having an electron attracting group, said process comprising the step of allowing (A31) a compound having a methine carbon atom and being shown by the following formula (14):

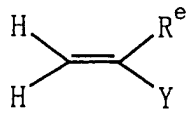


(14)

wherein each of R^o, R^p, and R^q is, identical to or different from one another, an organic group, where R^o, R^p, and R^q may be combined to form a ring with the adjacent carbon atom, to react with (B15) an active olefin shown by the following

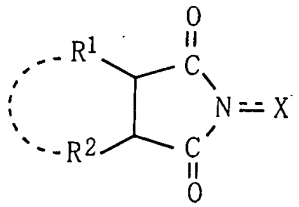
formula (3c):

cont B3



(3c)

wherein R^e is a hydrogen atom or an organic group; and Y is an electron attracting group, in the presence of molecular oxygen by catalysis of an imide compound shown by the following formula (1):

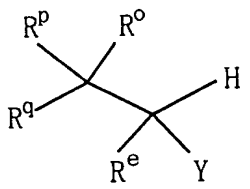


(1)

wherein each of R^1 and R^2 is, identical to or different from each other, a hydrogen atom, a halogen atom, an alkyl group, an aryl group, a cycloalkyl group, a hydroxyl group, an alkoxy group, a carboxyl group, an alkoxycarbonyl group, or an acyl group, where R^1 and R^2 may be combined to form a double bond, or an aromatic or non-aromatic ring; X is an oxygen atom or a hydroxyl group; and one or two N-substituted cyclic imido groups indicated in the formula (1) may be further bonded to said R^1, R^2, or to the double bond or aromatic or non-aromatic ring formed together by R^1 and R^2,

to yield an organic compound shown by the following formula (18):

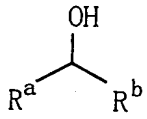
cont B3



(18)

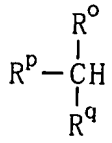
wherein R^e, R^o, R^p, R^q, and Y have the same meanings as defined above.

19. A process for producing an organic compound according to claim 1, wherein (A11) an alcohol shown by the following formula (2):



(2)

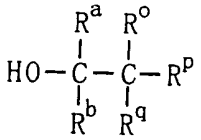
wherein each of R^a and R^b is, identical to or different from each other, a hydrogen atom or an organic group, where R^a and R^b may be combined to form a ring with the adjacent carbon atom, is allowed to react with (B21) a compound having a methine carbon atom and being shown by the following formula (14):



(14)

wherein each of R^o, R^p, and R^q is, identical to or different from one another, an organic group, where R^o, R^p, and R^q may be combined to form a ring with the adjacent carbon atom, in the presence of molecular oxygen by catalysis of the imide compound of the formula (1), to yield an alcohol shown by the

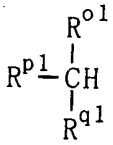
following formula (19):



(19)

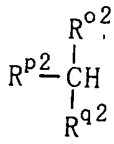
wherein R^a, R^b, R^o, R^p, and R^q have the same meanings as defined above.

20. A process for producing an organic compound according to claim 1, wherein (A32) a compound having a methine carbon atom and being shown by the following formula (14a):



(14a)

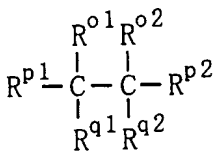
wherein each of R^{o1}, R^{p1} and R^{q1} is, identical to or different from one another, an organic group, where R^{o1}, R^{p1} and R^{q1} may be combined to form a ring with the adjacent carbon atom, is allowed to react with (B22) a compound having a methine carbon atom and being shown by the following formula (14b):



(14b)

wherein each of R^{o2}, R^{p2} and R^{q2} is, identical to or different from one another, an organic group, where R^{o2}, R^{p2} and R^{q2} may be combined to form a ring with the adjacent carbon atom, in the presence of molecular oxygen by catalysis of the imide compound of the formula (1), to yield a coupling product shown

by the following formula (20):



(20)

wherein R^{o1}, R^{p1}, R^{q1}, R^{o2}, R^{p2} and R^{q2} have the same meanings as defined above.

21. A process according to one of claims 1 to 3 and 14 to 20, wherein a metallic compound is used as a co-catalyst.

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